



Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2016

Veterinary Epidemiology Paper 1

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **ALL EIGHT (8)** questions

Answer **EIGHT** questions each worth 15 markstotal 120 marks

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Paper 1: Veterinary Epidemiology

Answer all eight (8) questions

1. Nominate an infectious disease in animals with which you are familiar. Describe this nominated disease's important epidemiological features and how these are used in the control and/or management of this disease. *(15 marks)*

2. Describe at least **five (5)** of the Hill's criteria for making causal inferences and discuss their strengths and limitations. *(15 marks)*

3. Answer **all** parts of this question:
 - a) Justify your choice of **two (2)** situations when you would prefer to select a test with high sensitivity while compromising on specificity. *(5 marks)*

 - b) Justify your choice of **two (2)** situations when you would prefer to select a test with high specificity while compromising on sensitivity. *(5 marks)*

 - c) If diagnostic tests with desired sensitivity or specificity are not available, how would you use information from multiple tests to improve the sensitivity and specificity of a combination of tests? *(5 marks)*

4. Answer **both** parts of this question:
 - a) Discuss **two (2)** examples of the application of disease spread models to inform animal disease control and/or prevention. *(7 marks)*

 - b) Describe how a geographical information system (GIS) can be used in the investigation of a disease outbreak. *(8 marks)*

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5. Answer **both** parts of this question:

- a) List the types of outcome and explanatory variables that can be analysed using linear and binomial logistic regression. Describe how you would interpret coefficients from univariable linear and binomial logistic regression models for an explanatory variable of your choice. (8 marks)
- b) Define the term clustering. Give **two (2)** examples of clustered data and explain why veterinary epidemiologic data is often clustered. (7 marks)

6. Answer **all** parts of this question:

- a) Explain confounding bias in epidemiological studies. (5 marks)
- b) Using examples and causal diagrams, discuss the criteria used to determine if a variable is a potential confounder. (5 marks)
- c) Differentiate between confounding and interaction (effect modification). (5 marks)

7. Answer **both** parts of this question:

- a) Explain the method of cost benefit analysis. (10 marks)
- b) Describe how a cost benefit analysis could be used for evaluating an animal health programme. (5 marks)

8. Answer **both** parts of this question:

- a) Discuss the differences between active and passive surveillance. (5 marks)
- b) Identify the advantages and disadvantages of **both active and passive surveillance**. (10 marks)

End of paper



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Paper 2

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **ALL THREE (3)** questions

Answer **THREE** questions each worth 40 marks.....total 120 marks

Paper 2: Veterinary Epidemiology

Answer all three (3) questions

1. You have been asked to provide epidemiological support to investigate an outbreak of mortalities that has occurred in a free-range chicken layer farm.

Answer **all** parts of this question:

- a) Describe in detail the steps you would take to investigate this outbreak. *(25 marks)*
- b) The producer provides you with the following data of mortalities in four sheds which house 12,500 birds each. For **shed one only, calculate and interpret** the cumulative mortality/mortality risk assuming a starting population of 12,500 birds in the shed. *(5 marks)*

| Day | Shed 1 | Shed 2 | Shed 3 | Shed 4 |
|-----|------------|--------|--------|--------|
| 1 | 80 | 2 | 0 | 0 |
| 2 | 245 | 110 | 2 | 1 |
| 3 | 213 | 435 | 0 | 0 |
| 4 | 42 | 890 | 1 | 1 |
| 5 | 38 | 1300 | 1 | 1 |
| 6 | 13 | 500 | 0 | 5 |
| 7 | 15 | 400 | 2 | 2 |
| 8 | 10 | 150 | 15 | 15 |

- c) Using the same data, calculate and interpret the mortality density/rate in **shed one only**. You may assume that the birds remained at risk up to and including the day of their death. *(10 marks)*

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2. The following is a modified excerpt from the abstract and method of a paper from the Veterinary Record, November 25, 2015 titled:

Prevalence factors associated with equine herpesvirus type 1 infection in equids with upper respiratory tract infection and/or acute onset of neurological signs from 2008 to 2014.

Abstract

The objective of the present case-control study was to determine factors associated with the detection of equine herpesvirus type 1 (EHV-1) by quantitative PCR (qPCR) in horses presented to veterinarians with clinical signs related to an acute upper respiratory tract infection and/or acute onset of neurological disease from March 2008 to December 2014. Statistical analyses were performed to determine the association between risk factors (demographic, geographic and management) and EHV-1 status.

A total of 117/4228 (2.7 per cent) equids meeting the case definition tested qPCR-positive for EHV-1.

Materials and methods – study population

Two hundred and thirty-nine equine veterinary practices located in 38 states of the USA were enrolled in a voluntary surveillance programme for equine respiratory pathogens. The participating veterinarians were asked to collect blood and nasal secretions from equine patients that presented with signs of acute upper respiratory tract infection and/or neurological deficits. The case definition of horses to be sampled included one or more of the following signs: unexplained fever ($T > 101.5^{\circ}\text{F}$), depression, nasal discharge, coughing and acute neurological signs (ataxia, weakness, urinary incontinence, recumbency). Acute onset of neurological disease was included in the case definition in order to sample horses with possible EHV-1 myeloencephalopathy. Case submission occurred over 82 months (March 2008 to December 2014). A diagnosis of EHV-1 infection was made based on the presence of clinical signs and the laboratory detection of EHV-1 via quantitative PCR (qPCR).

(Copyright BMJ Publishing Group Ltd. Reproduced from *Prevalence factors associated with equine herpesvirus type 1 infection in equids with upper respiratory tract infection and/or acute onset of neurological signs from 2008 to 2014*, N. Pusterla, S. Mapes, N. Akana, C. Barnett, C. MacKenzie, E. Gaughan, B. Craig, D. Chappell, and W. Vaala, copyright 2015, with permission from BMJ Publishing Group Ltd)

Answer **all** parts of this question:

- a) Outline the purpose of this study. (5 marks)

- b) In your opinion, what type of study design was undertaken? Explain whether or not the stated description as a case-control study was an accurate reflection of the work undertaken. (7 marks)

Question 2 continued over page

Question 2 continued

- c) The data in the table below 2 e) have been adapted from the paper. Which measure/s of association and measure/s of effect would be used to evaluate association between gender and EHV-1 status? Justify your answer. (8 marks)
- d) Based on the data provided in the table below, calculate and interpret **one (1)** measure of association you nominated in part 2 c). Show the calculation. (10 marks)
- e) You decided to conduct a Chi-square test to evaluate whether the association between gender and EHV-1 status is statistically significant. Specify null and alternate hypotheses and the assumptions of this test. You are not required to conduct analyses. (10 marks)

| | EHV-1 PCR-negative | EHV-1 PCR-positive | Total |
|--------|--------------------|--------------------|-------|
| Female | 1505 | 47 | 1552 |
| Male | 2320 | 60 | 2380 |
| Total | 3825 | 107 | 3932 |

3. You have been asked to design a study to determine the herd prevalence of bovine viral diarrhoea virus (BVDV) in beef cattle herds within your local government area and to identify factors associated with herd BVDV status.

Answer **all** parts of this question:

- a) Nominate a study type and justify its use for this purpose. (7 marks)
- b) Describe the steps to design this study, including population sampling methods to be used. (13 marks)
- c) Explain what variables you would measure to collect data on risk factors for herd BVDV status in this study, including **two (2)** examples of questions. (10 marks)
- d) Describe at least **two (2)** types of bias that may occur in this study. (5 marks)
- e) Discuss how you might control for confounding at the time of designing this study and/or during analyses of data from this study. (5 marks)

End of paper